U.S. FRIEDT APPLICATION SCRIET NO. 1475/2/1879
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James I. Ewing, IV, Telephoner 404.815.6494
Attorney: Docket No. 14088/299978
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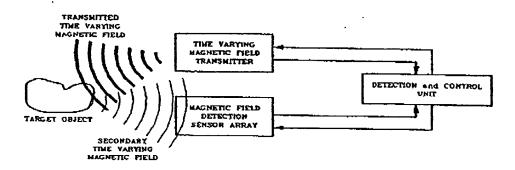


FIGURE 1-1 SYSTEM BLOCK DIAGRAM

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And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404.815.6494
Attorney Docket No. 14088/29978
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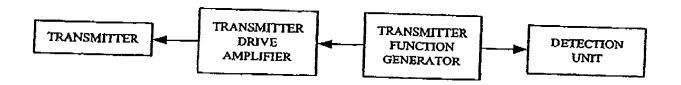


FIGURE 1-2 TRANSMITTER WITH KNOWN OUTPUT FUNCTION

Filed: April 19, 2004, Inventor: James Wagner Luxen For: Systems and Methods Useful For Detocting Presence And/Or Location Of Verious Materials Attorney: James L. Ewing, IV. Telephone: 404.815.6494 Attorney Docket No. 14088/299978 REPLACEMENT DRAWING

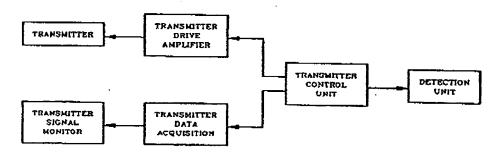


FIGURE 1-3
TRANSMITTER WITH MAGNETIC FIELD MONITOR

4048156118

KILPATRICK\_STOCKTON

U.S. Patent Application Serial No. 10/827,089

Filed: April 19, 2004, Inventor: James Wagner Larsen

For: Systems and Methods Useful For Detecting Presence

And/Or Location Of Various Materials

American Lorse L. Design IV. Takeshoot, 404,213,6414 Attorney: James L. Ewing, IV, Telephone: 404.815.6494 Attorney: Jones L. Ewing, IV, Telephone: 404.815.6494 Attorney Docket No. 14088/299978 REPLACEMENT DRAWING

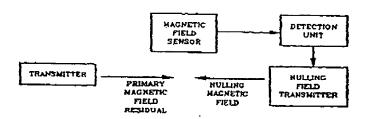


FIGURE 1-4A RESIDUAL MAGNETIC FIELD NULLING USING A NULLING MAGNETIC FIELD

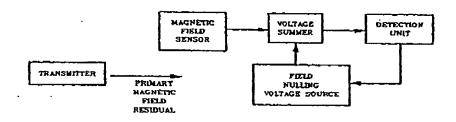


FIGURE 1-4B VOLTAGE NULLING OF RESIDUAL FIELD SENSOR OUTPUT

U.S. Pannt Application Scrial No. 10/327,089
Filed: April 19, 2004, Inventor: James Wagner Laisen
For: Systems and Methods Useful For Denoting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404.815.6494
Amorney Docket No. 14083/299978
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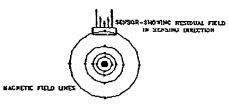


FIGURE 1-5A
TRANSMITTER COIL CROSS SECTION FOR SINGLE WIRE COIL
SHOWING SENSOR POSITION AND RESIDUAL FIELD

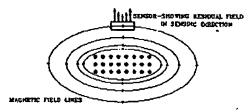


FIGURE 1-5B
TRANSMITTER COIL CROSS SECTION FOR NORMAL RECTANGULAR COIL
SHOWING SENSOR POSITION AND RESIDUAL FIELD

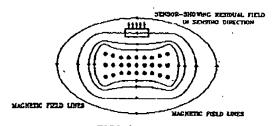


FIGURE 1-5C
TRANSMITTER COIL CROSS SECTION FOR SHAPED COIL
SHOWING SENSOR POSITION AND RESIDUAL FIELD

KILPATRICK\_STOCKTON

Filed: April 19, 2004, Inventor: James Wagner Larsen

For: Systems and Methode Useful For Detecting Prosence
And/Or Location Of Verious Materials
Amoracy: Juries L. Ewing, JV. Telephone: 404,815,6494

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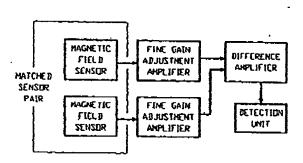


FIGURE 1-6 GRADIENT SENSING USING A MATCHED SENSOR PAIR

U.S. Patent Application Serial No. 10/827,089
Piled: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence,
April 19, James L. Ewing, IV, Telephone: 404.815,6494
Attorney Docket No. 14088/299978
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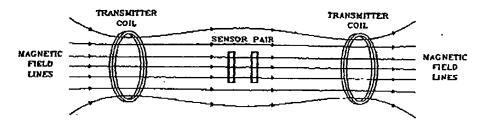


FIGURE 1-7
SENSOR PAIR CALIBRATION
USING TWO TRANSMITTER EQUAL COILS

4048156118

U.S. Patent Application Serial No. 10/827,059
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence .
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404.815.6494
Attorney: Docket No. 14088/299978
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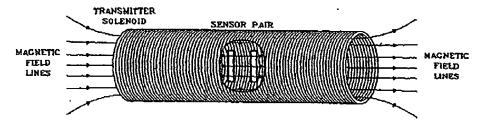


FIGURE 1-8
SENSOR PAIR CALIBRATION
USING A LARGE SOLENOID COIL

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James J. Ewstag, IV, Telephone: 404.815.6494
Attorney: James J. Ewstag, IV, Telephone: 404.815.6494
REPLACEMENT DRAWING

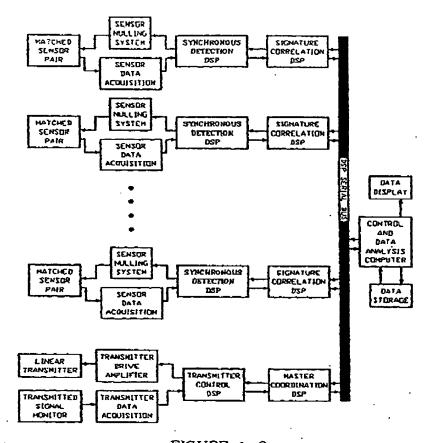


FIGURE 1-9
SYSTEM WITH MULTIPLE SENSOR PAIRS
AND SYNCHRONOUS DETECTION
BASED ON DSP PROCESSORS

4048156118

U.S. Patent Application Serial No. 10/827,089
Filod: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
Aud/Or Location Of Various Materials
Attorney: James L. Ewing, IV. Telephone: 404.815.6494'
Attorney Docket No. 14088/29978
REPLACEMENT DRAWING

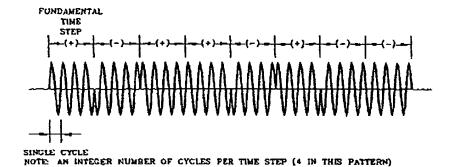


FIGURE 1-10 AN 8 SECTION (+ - + + - + - -)

TIME ENCODED WAVEFORM

KILPATRICK\_STOCKTON
U.S. Parent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Lerson
For: Systems and Methods Useful For Detecting Presence.
And/Or Location Of Various Materials
Attorney: James L. Ewing, Iv. Telephons: 404.815.6494
Attorney Docket No. 14088/299978
REPLACEMENT DRAWING

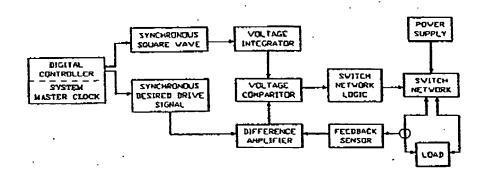
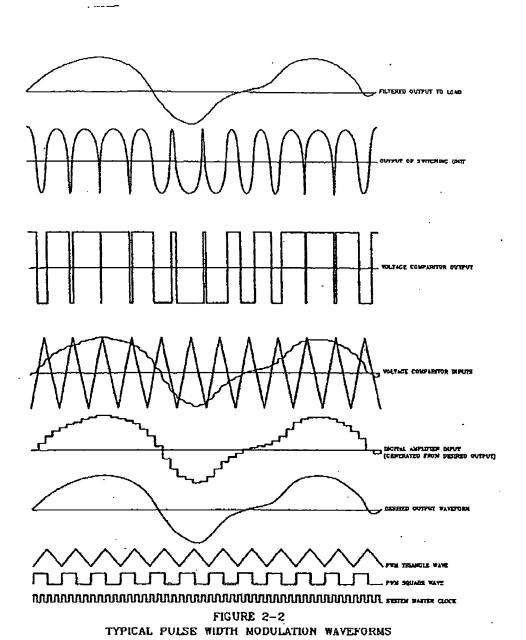


FIGURE 2-1 SYNCHRONOUS PULSE WIDTH MODULATION AMPLIFIER

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: Jures Wagner Larsen
For: Systems and Methods Useful For Detecting Presence.
And/Or Location Of Vurious Materials
Antomey: James L. Ewing, IV, Telephone: 404,313,6494
- Attorney Docket No. 14083/299978
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PAGE 22/36 \* RCVD AT 3/3/2006 3:37:01 PM [Eastern Standard Time] \* SVR:USPTO-EFXRF-1/19 \* DNIS:2738300 \* CSID:4048156118 \* DURATION (mm-ss):06-40

4048156118

Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence Por: Systems an Memorian System For Devecting Presence And/Or Location Of Versious Meterials Attorney: James L. Ewing, IV. Telephone: 404.815.6494 Attorney Docket No. 14088/299978 REPLACEMENT DRAWING

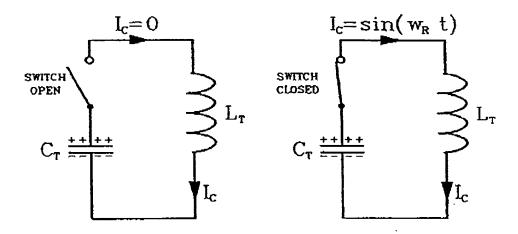


FIGURE 4-1 WHEN SWITCH IS CLOSED CIRCUIT OSCILLATES AT RESONANT FREQUENCY, WR

V.S. Patent Application Serial No. 10/327,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detocting Presence
And/Or Location Of Various Materials
Attorney: James L. Eving, P. 7, Flephonet: 404.815.6494
Attorney Docket No. 14088/299978
REPLACEMENT DRAWING

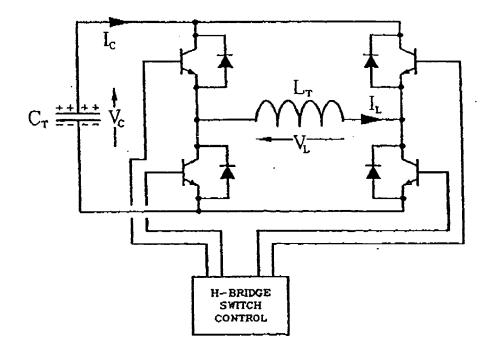


FIGURE 4-2 AN H-BRIDGE SWITCH NETWORK CONNECTINT THE CHARGED CAPACITOR TO THE LOAD COIL

U.S. Patent Application Serial No. 10/827,089
Piled: April 19, 2004, Inventor: James Wagner Larson
Por: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404.815.6494
Attorney: James L. Ewing, IV, Telephone: 404.815.6494
REPLACEMENT DRAWING

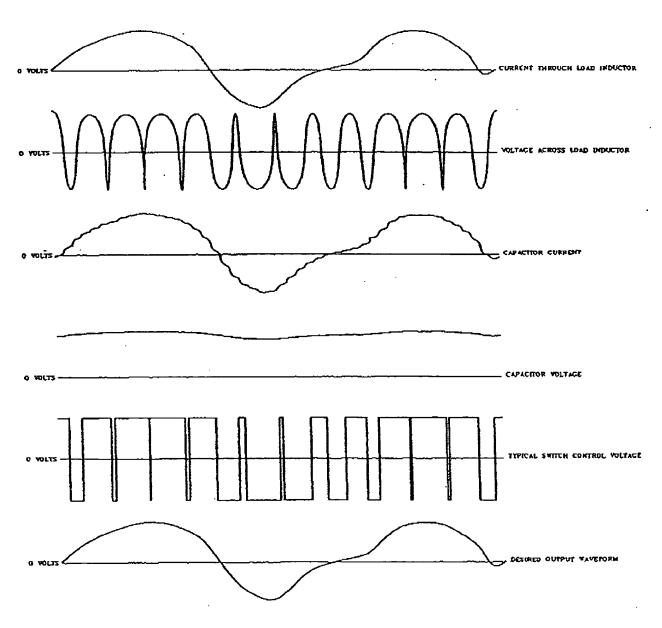


FIGURE 4-3
SWITCHED CAPACITOR CIRCUIT WAVEFORMS
PAGE 25/36 \* RCVD AT 3/3/2006 3:37:01 PM [Eastern Standard Time] \* SVR:USPTO-EFXRF-1/19 \* DNIS:2738300 \* CSID:4048156118 \* DURATION (mm-ss):06-40

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: Jurger Wagner Larson
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Antomey: James L. Ewing, IV, Telephone: 404.813.6494
Antomey Dockel No. 14088/299978
REPLACEMENT: DRAWING

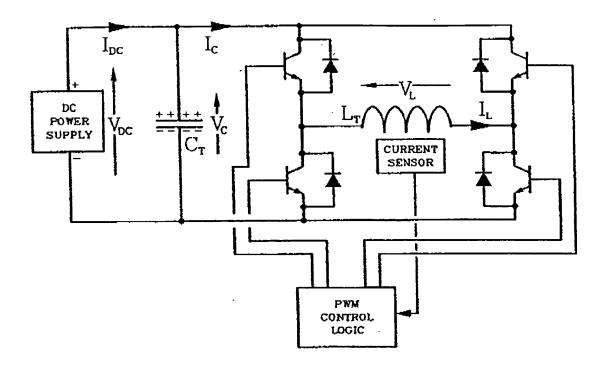


FIGURE 4-4
PULSE WIDTH MODULATED
SWITCHED CAPACITOR RESONATOR

U.S. Patern Application Serial No. 10/327,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewbng, IV. Telephone: 404.815.6494
Attorney Docket No. 14088/299978
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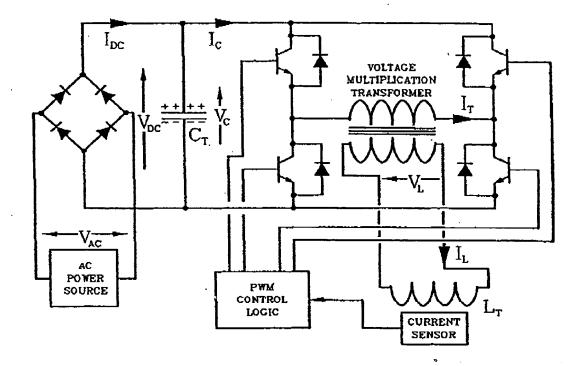


FIGURE 4-5
SWITCHED CAPACITOR RESONATOR
WITH INTEGRAL SWITCHING POWER SUPPLY

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, taventor, James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404,815.6494
Antonney Docket No. 14088/299978
REPLACEMENT DRAWING

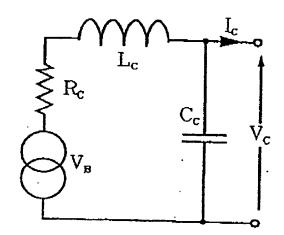


FIGURE 5-1 SENSE COIL EQUIVALENT CIRCUIT

KILMATRICK
U.S. Patent Application Serial No. 10/827,039
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Antonney: James L. Bwing, IV, Telephone: 404.813.6494
Antonney Docket No. 14088/299978
REPLACEMENT DRAWING

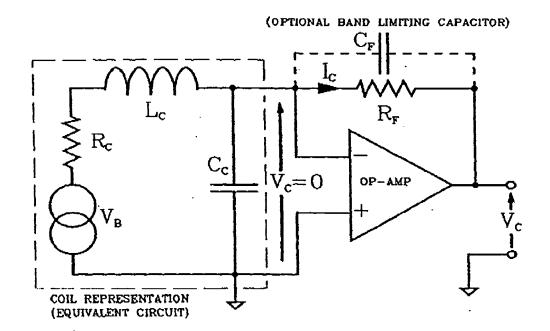


FIGURE 5-2
OPERATIONAL AMPLIFIER BASED
VOLTAGE TO CURRENT CONVERSION CIRCUIT

U.S. Psteot Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Lursen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404.815.6494
Attorney Docket No. 14088/299978
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#### SENSITIVITY FOR #32 WIRE WITH RI+10MOhm

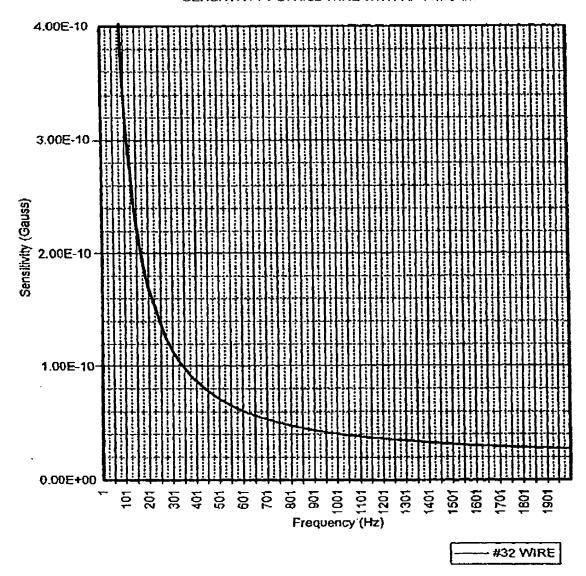
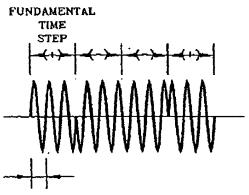


FIGURE 5-3

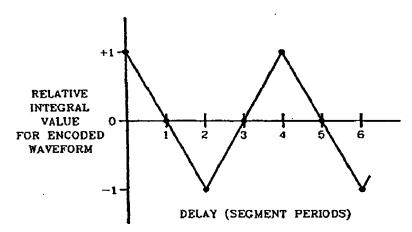
U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence,
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephoue: 404,815,6494
Attorney: Docket No. 14088/299978
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SINGLE CYCLE

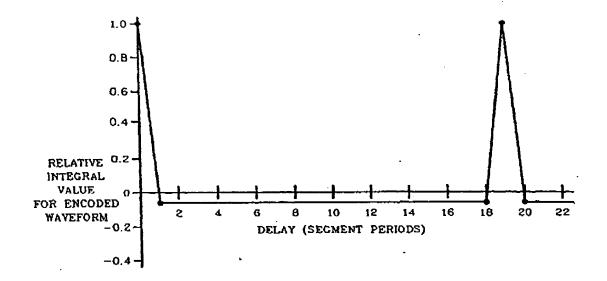
NOTE: AN INTEGER NUMBER OF CYCLES PER TIME STEP (3 IN THIS PATTERN)

FIGURE 6-1 A 4 SEGMENT (+ - - +) TIME ENCODED WAVEFORM U.S. Paient Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: Jaures Wagner Larsen
For: Systems and Methods Useful For Detecting Presenge
And/Or Location Of Various Materials
Antorney: James L. Ewing, IV, Telephone: 404,813,6494
Attorney: Dockat No. 14038/299978
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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS ZERO

FIGURE 6-2 CORRELATION OF THE 4 SEGMENT (+ - - +) ENCODED WAVEFORM WITH ITSELF U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Lanen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attropy: James L. Ewing, IV, Telephone: 404.313.0494
Attorney Docket No. 14088/299978
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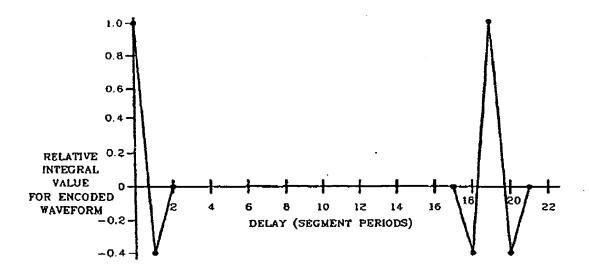


NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS 0.0526

FIGURE 6-3
CORRELATION OF THE 19 SEGMENT
(++++--++-+-+-)
ENCODED WAVEFORM WITH ITSELF

4048156118

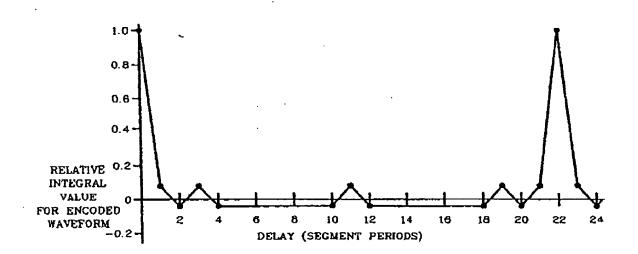
U.S. Patent Application Social No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Meterials
Attornoy: James L. Ewing, JV. Telephone: 404,815,6494
Amoney Docket No. 14088/299978
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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS -0.1

FIGURE 6-4
CORRELATION OF THE 20 SEGMENT
(+--++-+-+-+)
ENCODED WAVEFORM WITH ITSELF

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: Junes Wagner Larsen
For: Systems and Methods Useful For Detecting Presence.
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV. Telephone: 404.815.6494
Attorney Docket No. 14038/299978
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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS ZERO

FIGURE 6-5
CORRELATION OF THE 22 SEGMENT
(++++---+-+-++--++-)
ENCODED WAVEFORM WITH ITSELF

U.S. Patent Application Serial No. 10/827,089
U.S. Patent Application Serial No. 10/827,089
Filed: Appli 19. 2004, Inventor: James Wagmer Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Amorney: James L. Ewing, 1V, Telephone: 404.815.6494
Antonney Docket No. 14088/299978
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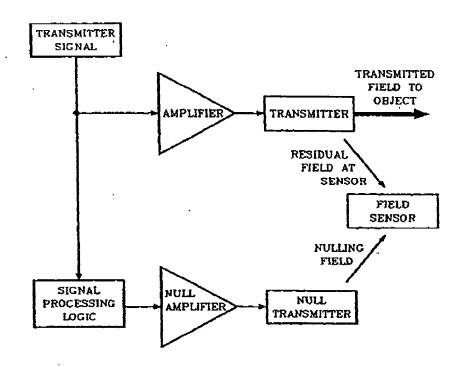


FIGURE 7-1 LOCAL MAGNETIC FIELD GENERATION FOR RESIDUAL FIELD CANCELLATION

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